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VOL. XVIII AUGUST, 1931 No. 8

EDITORIAL

Our President and Retiring President

In electing Mr. Philip Sievering of Newark Branch to the office of Supreme President, the American Electro-Platers Society took the opportunity of showing its appreciation of the splendid work done by him as Secretary-Treasurer of the Research Committee for a number of years. With remarkable zeal and earnestness, Mr. Sievering was one of the leading figures in placing this important committee in its present financial condition, which was a task of considerable magnitude. All work of this kind develops gradually. The winning of moral and financial support, whereby competent associates are kept at the Bureau of Standards under the direction of Dr. Blum, is the outcome of the untiring efforts of the Research Committee. The direct results of the work done at the Bureau we are all familiar with; the indirect benefits to the platers and manufacturers alike are so far reaching in their effect that they cannot be defined.

Mr. Sievering's work will be recalled many years hence as the Research Committee expands to still further fields of usefulness. The loyal support of our membership is hereby extended to our new President as he takes up the important duties of his office.

Mr. Gehling joins the ranks of the past presidents, which does not in any sense mean that he is a "has been." No man ever had the interests of the Society at heart more than George has. His term as president was one of accomplishment. The Bureau of Education,

which was transformed from inaction to a powerful influence for good, is perhaps the outstanding achievement of his administration. In all matters pertaining to the welfare of the A. E. S., Mr. Gehling used sound judgment and common sense, both as Secretary and President.

The members of the Executive Board take this opportunity of thanking him for his close cooperation during the past year, and with our entire membership hope he will be spared for many years to share in the deliberations and destinies of the organization which is closest to his heart.

With men like these who can fill the office of president so acceptably, the future of our Society is assured. The year before us is full of promise. Let us take courage and go forward.

CONVENTION NOTES

One of the familiar faces we missed at the Rochester convention was Dr. A. K. Graham of Philadelphia Branch.

* * * * *

Why do we hold our conventions in the hottest days of the summer? was a question very frequently asked. The answer is, instruct all delegates to vote for a change of dates at Philadelphia in 1932.

* * * * *

At one of the social gatherings connected with the convention in Rochester a group of delegates were discussing the possibilities of forming new branches. One very prominent member of the Society suggested a branch in the central part of Pennsylvania which would include York, Lancaster and Harrisburg.

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During President Gehling's invitation to convene in the Quaker city next year he promised that the registration fee would be one dollar. Well, if George says so that settles it. He doesn't let his enthusiasm get out of bounds very often.

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We missed Past President Horace Smith of Newark Branch. Here's hoping Mrs. Smith is well on the way to recovery.

* * * * *

Rochester is a beautiful city. The Rochester people are particularly sociable. The committees who had the convention arrangements in charge are to be congratulated on the way their plans were carried out. The banquet with the novel features presented was one of the best. Why not use the movie camera more in our future conventions?

* * * * *

Don't forget the city of brotherly love next year.

OUR PRESIDENT

PHILIP SIEVERING was born in New York City, July 29, 1863, and shortly afterward his folks moved to Newark, N. J., where they have since resided. He attended public school until 14 years of age. In 1877 started in the polishing and plating trade, working in several Newark shops. In 1882 went to the Singer Mfg. Co. at Elizabethport as assistant foreman. In 1884 accepted a position as foreman plater with the American Caligraph Typewriter Co. at Hartford, Conn. Was there only eight months when he was recalled to the Singer Co. to take the full foremanship of the plating department under Mr. Alexander Bennett. In the year of 1888 Mr. Bennett lost his life in the famous March blizzard. He was then placed in full charge of the plating department and remained there until June, 1889. Then he went to New York and started in the job plating business, and has continued there 42 years. During that time three sons have been taken into the business who are now in

active management. From 1882 to 1886 studied chemistry at Cooper Union in New York City. In 1912 joined the New York Branch, A. E. S., shortly thereafter became a charter member of the Newark Branch, and is now one of its past presidents. Has represented the Newark Branch as a delegate to the Supreme Society for a number of years. Has acted as secretary-treasurer of the Research Fund for the past four years.

PRESIDENT'S LETTER

Members of the American Electro-Platers Society, allow me to convey my thanks to you, through THE MONTHLY REVIEW, for elevating me to the position of Supreme President at the convention held in Rochester June 29 to July 2, 1931. In accepting this position I am fully aware of its responsibilities, and that you look to me as your leader to further the prestige and scope for which this Society stands; namely, to disseminate new ideas and scientific data which will enable the members to be fully informed of progress in the art of electro-plating. With this object in view and in order to help the Society attain its highest standards, I must have your individual and cooperative assistance. This I know I will receive from one and all.

I know of no greater honor than to earn the esteem and respect of other men. This I will strive to do through my actions so that at the end of my term of office I can look to my fellow men and say that the confidence placed in me has not been betrayed.

PHILIP SIEVERING, *Supreme President.*

THE GOOD FELLOWSHIP CLUB,
MR. T. A. TRUMBAU, *Secretary.*
Gentlemen:

In behalf of the American Electro-Platers Society, I wish to acknowledge your generous gift of $70.00 to the Research Fund. Aside from the donation itself, the Society appreciates your endorsement of our research program. Kindly accept our gracious thanks.

Sincerely yours,
H. A. GILBERTSON.

ELECTRO-PLATING ON COLD ROLLED STEEL

By Mr. George B. Hogaboom
Read at the Rochester Convention, 1931

When I began to get data for this subject, I found I got over my head, and I thought that I would ask the indulgence of the Society, not disappoint them, and bring up some points that had been investigated, and ask for a general discussion, because I believe that those assembled can contribute greatly to the story of properly electro-plating cold rolled steel.

We have received a number of inquiries regarding the plating of cold rolled steel, and in laying out cycles for full automatics we have been up against it on some classes of cold rolled steel, and that has demanded an investigation. We have certain theories, and basing these upon some points that were brought out by some authors has led us to believe that it would be well if the platers could understand just exactly what they are plating. We see a piece of cold rolled steel, and we get a visual picture, and we know nothing about the process through which it passed, or the effect of that process upon the forming, the polishing or the plating of it.

The process of manufacturing cold rolled steel has changed somewhat. It had been the common practice, in nearly all the cold rolled steel that was supplied a few years ago, to pack roll it. That is, one sheet was bent over another, and then, after it was rolled, was bent over upon itself, and several layers of metal were rolled one on top of the other. That naturally gave a different surface condition to the steel than it has in the present method, which is used quite extensively, of strip rolling, where they roll the metal in strips and have gang rolls, passing it from one to the other, just going through and passing back, or the rolls one above the other, some of them as much as four high.

Then we have found also with some steel that it had been the practice several years ago of hot rolling to a certain gauge, annealing at a definite temperature, pickling and then, after the required number of passes, to anneal it so as to keep away oxidation, or prevent oxidation, and to do that after each number of passes which was required to harden the metal. When that metal was finished, it had a uniform structure throughout. The grain size was approximately the same throughout the whole steel. That gave an excellent metal upon which to deposit. But we have found also that today metal is hot rolled to a gauge, pickled, and then cold rolled on the

surface. That gives a skin of cold worked metal, and it is very difficult to examine that and to detect it under a microscope. I have looked at some steel that had been pack rolled and some strip rolled, and you can't determine the difference under ordinary magnification. Now you can detect the difference in the steel that is hot rolled and has this cold rolled surface. It isn't perceptible unless you use pretty high magnification, and look at it in cross-section.

It seems that this stock is what is giving the most trouble. It can be purchased at a lower price than pack rolled or even strip rolled metal, and what we find is that you have a large crystal structure inside, and then you have a fine crystal structure just on the surface. When that is formed, oftentimes that surface structure breaks, and then you have the hot rolled stock. I have seen some work that was made from this stock, that was required to be heated after it was nickel plated, with the result that while the adherence was perfect, you could buff it, you could hammer it, you could do anything with it until it was heated. After it was heated, you got innumerable little fine blisters all over the stock. You break those blisters and look under, and you find that you have got the hot rolled effect. You have got the oxygen rolled in, and it prevents good adhesion.

I spoke at one of the branches last May, and an enamel man had a piece of japanned stock, and he said he couldn't explain the cause of the trouble, and he had taken it up with the steel people, and they could offer no explanation. I didn't attempt to offer any explanation, but the probable cause was that this was the class of stock that was used. It was japan enameled, run up to a high temperature, and the difference of expansion between the center and the outside caused hair-line cracks to develop, and when the piece was japanned it looked as if pieces of lint had fallen on the japan. We have seen that, and we have seen the effect of that in electro-deposition. We all know that if metal is worked there may be an amorphous or a non-crystalline structure just on the surface. Remember the work of Beilby, where he took a piece of antimonial lead, scratched it, and just polished it with a piece of soft leather, flowed the metal right over the scratch, then etched that surface, and the scratch was not removed. Just the surface of the metal had flowed over, and still left the scratch.

We also have found that in drawing operations there is a heat friction, and that heat friction causes not only a flowing of the metal on the surface so as to give that amorphous condition, heavier

than it would be in ordinary work, but also that it gives an invisible oxide coating.

I referred to that in a talk or a discussion on one of the papers at Detroit. Hugh R. Evans brought out that if you had a piece of steel, and you applied a flame at one end, you would get this result:

Purple here at the left, and down through here you would get your yellow. And that film, the difference in color, was caused by the difference in thickness of the film, and the supposition would be that oxide film would stop just where the yellow stopped. But he found that wasn't true.

He obtained his purple there (at left), but his yellow stopped here (in the center). And then from there on was an invisible oxide film. He made a molar solution of copper nitrate, and it took a long time before he got a precipitation of copper. We have seen work that has been drawn, which has been required to be plated on the inside, where it has stood up as high as six minutes before the copper would penetrate, and that was applying copper to the surface once every minute a fresh solution, taking it off with blotting paper and applying a fresh solution, showing an invisible oxide film.

Evans went further and he put that in an iodine solution and he got the characteristic curls of iron oxide.

It is reasonable to assume that if a piece of stock is hot rolled, and then run through a high pressure burnishing roll to give a surface condition, you are going to get an oxide film. We put that in a pickling solution, and we get a dust and we call it carbon. The carbon percentage of that dust is very small. It is more of an oxide of iron. And we have been attributing that dust that we got on the steel to either the carbon coming up; that is, the steel has been leached out or the iron has been leached out, and the carbon has remained. But if you will examine it closely you will find that a great deal of that is oxide of iron.

That presents, just merely briefly, a picture of the steel stock which the platers are called upon to handle. I talked with one of our well-known members a short time ago, and he told me that

stock which is painted is used for plating, and that he does not have the same success that he had a few years ago when they were using regular cold rolled stock, and I think he will take part in this discussion. I hope so. If he don't, I want to call on him. Walter Fraine, I am looking at you.

I talked to Dr. Gillette, who handles the Batelle Institute that was established to study problems in steel, and he has promised that if we will collect sufficient data so as to give an indication that the problem is a serious one with the electro-plating industry, they will find some means of studying it. And that is why I am bringing that before you this morning. I feel that the thing exists. I can't place my finger exactly upon its cause, I am giving you the probable causes, but I do know that you can plate some pieces of cold rolled steel that will come out beautifully, and I have seen other pieces that would not plate satisfactorily, that would come through in a blotchy manner, and if you pickle it long enough so as to remove that oxide film, then you get a coarse surface, and it will destroy the finish or decrease the quality of the finish that is desired. Especially if the work is to be nickel plated and highly colored and chromium plated. I thank you. (Applause.)

CHAIRMAN GILBERTSON: Now for a few minutes of brief discussion. Are there any questions?

MR. WALTER FRAINE: Speaking of the electro-plating of sheet steel, especially the cheaper grades of sheet steel, we find it decidedly different from what it was some years ago. Steel at the present time is marketed at extremely low prices. And in order to do that, certain things must be done in the manufacture of that steel to bring the costs down so that they can put it on the market at low prices. In doing that, some of the operations that were formerly used have been eliminated, with the result that for ordinary purposes they have furnished a steel which is highly satisfactory, but when you come to put it through the polishing operations and plating, we find a considerable difference between the steel, especially on what we call furniture steel, as now furnished, and the steel that we had some years ago.

With us, the problem takes two phases. We finished this steel primarily (that is what we bought it for) for the enameled finishes on our register cabinets, and in handling that the enameling department puts on two priming coats, and then on top of that they put a graining coat and two to three lacquer coats. Now, in the operations

of handling that after it goes in the enameling room, after the ground coats are on, they are sanded down to get a smooth surface. And they were greatly troubled by finding what they called "high spots" on the steel, and they couldn't eliminate them. They would bob up, and in order to get rid of them they would have to send many of these parts back into the polishing department to have a roughing cut put on that particular spot, in order to reduce that high spot down to the level of the surrounding surface. And it wasn't until we turned over to the chromium plating of many of these cabinets that we found out what was wrong with that steel. When we came to plate these cabinets, we found this, that in sending it through the ordinary hot cleaning solutions, and if we copper plated them, using a warm solution, we found our plate blistered, and when we came to investigate these blisters we found they were apparently solid; they weren't like the ordinary blister that comes up in plating, where you can lift it off and find a smooth surface underneath. But when you broke through the copper, you found the steel actually raised. In order to determine whether that was actually a steel blister or a plating blister, we went to the extent of stripping the copper off, so as to show the surface of the steel underneath, and we found these little blisters. Sometimes there would be only one or two, and sometimes there would be a network of them coming up on the surface. And due to the heat of your solution in cleaning and plating, these blisters developed.

Now the only explanation is that in the course of the rolling of your steel little pits have been covered over with fresh metal, forming occlusions of air and slag which remain in the steel. Anyway, it leaves an air pocket under the surface, and the heat of the solution simply expands that pocket, and you have a small blister raised there, which causes your trouble. And when you come to plate it, we find it a very common matter to have it.

We have had that up with the steelmakers for a long time, and they say they can eliminate it, but the extra cost of the steel due to the extra operations they will have to put it through, to bring it to the quality that we want, is such that it really puts it outside of our needs; that is, we can't afford to pay the price that they want for it. And the reason that it would cost us so much to have that done is because in general, the requirements for which this metal is used, the metal is plenty good enough; it doesn't cause them any trouble. But when we get into the plating proposition, we do have that

trouble, and we know that on examination of these blisters, when we open them up, we find slag underneath them in some cases, in other cases it is merely an air pocket. And there isn't enough demand on the part of industry for a better quality of steel, or enough of a better quality of steel, to justify the extra expense that the steelmakers would have to go to in bringing out a better grade of steel for the purpose. So I suppose that we will have to live with that and get along with it, but for your information, if you have to get into the handling of such a steel as furniture steel, and have to put it through polishing and plating operations and you get into this trouble, you can realize that it is not a trouble that is incident to the plating and polishing operations, but it is inherent in the product itself, and is brought out by the heating of the work. Either it will do it on the polishing wheel or buffing wheel, or it will do it in your cleaning solutions. But you will find you will have that, and there is apparently no remedy for it except by securing a better rolled stock, which would mean that they would have to put back into the sequence of operations of producing the steel some of the things that they have taken out in order to secure a product that can be put on the market at as low a price as steels are selling for today.

MR. GEORGE B. HOGABOOM: I think that one of the difficulties is that the user of steel hasn't realized this phase of the problem. He thinks that steel is steel, and he can use it for all purposes, but it is my opinion that if the manufacturers realize the extra cost of these losses, and troubles, that they will soon be willing to pay the price so that we can have steel that will give good results.

MR. C. VAN DERAU: This problem of steel that Mr. Hogaboom has tried to bring out is one of the problems we have to live with every day. Many of the steel suppliers don't realize what the cost of polishing steel is. Now, even though it is possible to polish out a lot of these pits, rolled in scale, pips, and so on as they are called, many times you will find that an operation that could be done for half a cent will cost you five or six cents to put on the extra polishing operation.

About six years ago, we had eight carloads of steel tied up on our switch that our inspection department rejected. We have a simple method of inspection by which we take a few sheets, a sheet out of a box of cold rolled, and we put it over a planer polisher to see whether it opens up, and if it opens up we tie the shipment up and bring the supplier in. Now, I will give you the cost of repairing and

bringing that steel up to standard. Take an iron cover, for instance. It weighs approximately one pound. The steel at that time was worth about six cents a pound. The extra polishing operation necessary to take out the pips and pits and this rolled-in scale amounted to nine cents. Well, the American Steel & Wire Company said, "Go ahead and put on the extra operation and bill us back." Well, when we brought them down and they found that the extra operation was going to cost nine cents to bring that steel up to shape to save six cents worth of steel, it would have been cheaper to throw the steel out and take a total loss, rather than spending nine cents to save six.

That is pretty much what we get into with cold rolled steel, and with any steel for polishing and plating, nickel, chromium, and so on. There is a lot can be done by working with the steel companies. Our steel problems have been lessened a great deal after quite a number of years. We find one of the best policies to follow is to tie up to as few sources of supply in steel as possible. Mr. Fraine brought out that this cutting of corners has taken something away from the steel that we used to have. Let's look into that picture and see why.

I think most everyone knows today that the American Rolling Mills practically control the steel market in cold rolled metals, or even in the hot rolled metals. They have put in several installations, and an installation costs them ten million dollars to put in, a full continuous one that rolls out sheets 125 feet in length. It is almost unbelievable the speed they roll this sheet steel out, taking it from their open hearths and on through. I had the pleasure of following through some of the billets a few months ago, and I thought I was going to trail this billet through this mammoth machine and furnace set-up, and the billet came out of the open hearth and just like that (snap of fingers) it was a 125-foot sheet of steel rolled up, and the crane had it picked up and was moving it into stock. That is how fast they can bring it through. I asked Mr. Stringham, the vice-president in charge of operations at the American Rolling Mills, how much money continuous rolling saved. It amounts to $12.00 a ton. Now, $12.00 a ton in steel is a real factor; it is the difference between profit and loss. The other steel rolling companies that have not gone in for continuous mills are faced with the greatest problem in their history. We have one in our town that was a going concern up till a couple of years ago, and they are operating now at the direction of the court, trying to salvage whatever can be salvaged.

They have a very fine rolling mill, as far as the regular method of rolling is concerned.

Now, one of the things you get into in that causes most of these pips and pits, and that is back at the open hearth at the time they make the billets. When they make a billet, they tap one of their cupolas, and they pour the billet, and the billet will be, let's say, eight feet long and eight to ten inches in thickness and anywhere from six to twenty inches in width. They pour that out, and the gases rise in there and keep coming up to the top. Now, to purify that billet, they generally drop in a little solution of aluminum. Aluminum has a purifying action on molten steel, in bringing all the gases to the top. It is not very much,—a handful of these aluminum slugs are dropped in, and you can see the gas roll. Then the steel company, to overcome these impurities, they have got to crop the end of the billet, and remelt that metal and keep purifying throughout their melting process. So that that is not rolled in.

Now, in this cropping operation, say it is necessary on an eight-foot billet to crop ten inches or twelve inches off, and they crop eight inches. It means that when the sheet is rolled, as this billet is rolled down, worked down to whatever size stock you are buying, there may be a little bit of a gas bubble or just a small particle of scale. When they roll that out in a sheet, that bubble has a tendency to be stretched out, and some of them may run the entire length of the sheet, or it may look like a place that the metal is actually broken.

Many times, when you get a lot of this gas, you get sheets of steel that will blister up, particularly when you put heat on them, and you will find all kinds of corrosion and rolled-in material that is apparently in between two sheets of steel. That started back here in a little bit of impurity in the way of gas or in the way of dirt which becomes scale in that process.

Now, another difficulty that you encounter a good many times with the sheet steel suppliers, and that is in their brushing. You take, from a hot roll, they pickle. They get an acid etch in the steel. They may not get all of the scale off, and as they bring it down through their cold rolls a certain amount of that will roll in. It is just like Mr. Hogaboom said, it is actually brushed over the top. But if you take one light cut across there, everything in the steel opens up, and as a matter of fact you don't need a micrographic camera to see it; you can see it with the naked eye, although they do prove the

point by taking photographs, in order to control it through the inspection department.

The cold rolled suppliers like the American Steel & Wire, and they are one of the large companies, are going in for continuous mills, paying a royalty to the American Rolling Mills Co., but there has been an attitude existent on the part of the cold rolled steel men that they put a polish high enough on there, to nickel plate and buff and get the highest finish, and they generally come back with an argument, "What do you polish it for? We polish it on the rolls." Well, after all, the rolling process is a form of polishing, and, as Mr. Hogaboom says, it rolls everything in and brushes over. When it is necessary to polish, due to a drawing operation, or due to the scratching it gets in handling, it is then that all these evils that lie underneath the steel show up, and it is the plater who has the job of telling his management the steel mill must be tightened up. We have even offered to pay bonuses for better grades of steel, and we have had the super steel that was as bad as common steel, and the only satisfactory way we have found has been to tie them up so that they pay for rejections, and it holds them in very good line, once you get the problem over to them. I know the Greer Steel Co. and the American Steel & Wire Co. both have put in polishing set-ups whereby they can test a sheet of steel to see how it would stand up for plating and polishing operations. But it is really surprising, their ignorance of the plater's requirements in steel. They think the whole thing lies in that rolled surface, and that is not the case, so that there is a lot of educational work that can be done to the mutual advantage of both the manufacturers and the platers and the steel industry itself, because it represents a tremendous loss to them.

Now, here is a little trick we use in practically every plant of any size. A purchasing department generally likes to buy from several suppliers, and they have one stock argument, and that is that if this place would burn down or blow up they would be out of the source of supply, and it is a pretty good argument and hard to beat. In a standardization program, through the factory, where you have wage incentives, where you have a standard set-up for your product, the shop man's job is trying to standardize everything, including all raw materials. If he has to standardize what he controls, he insists on the other fellows standardizing. We found one of our greatest troubles was to know whose steel was giving the trouble. For instance, we might have Newton Steel, American Steel & Wire, Armco, Greer

Steel, and maybe two or three others in process, and as soon as it is sheared or blanked out you lose the identification. So we worked out a very simple method of marking steel. We use a solution of 75% lacquer thinner, 10% lacquer, and 15% aniline dye, blue, green, red, brown, yellow, and so on down the line. Now, for each supplier we have a color. Then we take a tube, and we put a piece of felt in one end and a cork in the other, and the inspection department, as they inspect this steel, draw a strip clear through the sheet. That strip comes off the minute it strikes the first polishing operation or the minute it strikes the first cleaning operation. It contains just enough lacquer to make it stick so that you can see it. Now, in a sheet, if you blank out a piece, that line of color will run through, and be on every piece, no matter how many you make out of that strip. Well, blue to us would mean Greer Steel Co., and if that steel would commence to break in a draw press, or it would develop a lot of pits, scratches, and things of that kind, we would go back and pick up this blue mark, pick up that shipment, and Greer Steel Co. will get a bill from us for the extra work. And if it runs into any great amount of money we will hold up the shipment entirely, and many times ship it back, so that it is not much of a trick, but it certainly has saved the shop a lot and kept us out of a lot of arguments.

MR. PETER: Mr. Van Derau actually stated what I had in my mind to say. I can hardly add anything to it. I found the same conditions,—open surface, blisters, seams and pits. It is very difficult sometimes, as Mr. Van Derau states, to polish such steel, but it is always up to the plater to make good, not the steel mills. They get away with it if they can. Sometimes they can, sometimes not. But it is awfully hard for us to turn out a good piece of work if we don't get good metal.

THE BULLARD-DUNN PROCESS OF CLEANING

By Floyd T. Taylor

Read at Philadelphia Branch

The Bullard-Dunn Process for removing scales and oxides, singly or in combination, from metal surfaces is interesting from several angles. This process removes the scales and oxides without pitting, without etching and without hydrogen embrittlement. When it is used there can be no such thing as overtreatment, since, when the treatment is longer than necessary, no damage is done to the work, the only loss being the loss of time and an unnecessary use of electrical energy.

Heat treatment scales can be removed without any effect on the depth of the "case," and this is true whether the work is oil or water quenched.

Work cleaned in the process is so perfectly cleaned, even to the bottom of crevices and scratches, that visual inspection of the piece becomes easy, so that hardening cracks and other defects are readily detected, and consequently in actual practice defective parts are rejected directly after the cleaning process, avoiding altogether the expense of subsequent operations done on defective material. When gears are cleaned, scale is removed from the entire surface, including the bottom of the teeth, so that when these gears are assembled in a train there is no cutting from flaked-off scale, which when it mixes with oil forms a cutting combination very destructive to the life of gears. Moreover, the element of inspection just mentioned makes it almost an unnecessary thing to assemble a gear train with a defective gear which is likely to break and damage the whole gear train, causing a considerable loss either in the test operation of the machine or in the regular operation later on.

The machining of parts which have been cleaned in the process is cheap and easy because scale is removed entirely, and consequently the first cut can be a real first cut and not merely a scale-removing cut. The tool edges are not dulled by a scale-removing cut, therefore the life of the tools and the number of pieces that can be machined between the tool regrinds and resets is very much increased.

Polishing is very much reduced in cost when metals are previously cleaned in this process. Where metal with scale on it is polished, the first polishing operations are merely grinding operations done with polishing wheels, and the very nature of a polishing wheel, com-

posed as it is of a flexible abrasive face held to a compressible revolving wheel by a layer of adhesive, seriously limits the mechanical strain that can be put on the abrasive face. Where perfectly clean metal is to be polished, the strains on the polishing wheel are reduced, wheels do not glaze, and consequently the whole polishing operation is simpler and cheaper.

When this process of cleaning is used prior to plating, the definitely clean and scale-free surface which it produces will permit an original metal crystal growth of uniformity over the whole face. The avoidance of selectivity of the first film of electro-deposit means that such electro-deposited coatings are very much less porous than they would be if the initial deposit is selective and when the plated coating represents actually a development of nuclei.

The nature of the process itself is interesting in that the scale and oxides are removed by the mechanical action of hydrogen gas developed between the scale or oxide and the base metal itself.

Lead or any other suitable metal, which is a part of the scale-removing bath, is simultaneously deposited in an extremely thin, dense film on the bare metal thus exposed, and this protective metal film then laid down prevents the base metal itself from being affected in any way by the treatment. The scales and oxides blasted off the piece drop to the bottom of the tank as a sludge. It can be filtered out, and when solutions are filtered the result is that the life of the solution will be lengthened. If, however, the solution is not filtered, this sludge slowly dissolves in the weak electrolyte and will gradually build up a metallic content of the base metal in the solution. The building up of this metallic content, it should be noted, is slow, for two reasons: first, because the scale itself dissolves very slowly; and, second, because none of the pure base metal is dissolved at all.

The process is not a pickling process as pickling processes are commonly understood, since pickling processes dissolve the scale slowly and the base metal rapidly as the scale is sufficiently dissolved to permit the acid to attack the clean base metal. Only from the standpoint of technical definition that any acid solution is classed as a pickle and that any work treated in such a solution is technically said to be pickled, can this process be classed as such. In practice, however, we repeat that the process is distinctly not a pickling process for the reasons just stated.

Furthermore, the process should not be classed as a plating

process because it seems logical to consider an electro-plating process as being a process which will produce dense, adherent metallic coatings of appreciable thickness. Only the microscopically thin film deposited simultaneously with the removal of the scale in this process is dense and adherent. In other words, lead will plate on base metals in the sulphate-chloride electrolyte used in the process, but lead will not deposit on lead in a dense adherent coating in such an electrolyte. Therefore, after the film of lead has been deposited, any further deposition of lead is in the form of a loose, non-adherent powder which can be readily removed by rinsing or brushing.

As stated, the electrolyte used in the scale-removing treatment is usually composed of sulphuric acid and water with the addition of a small amount of chlorides. Lead anodes are generally used, although anodes of other metals are used for special applications. The work is treated in the scale-removing bath as the cathode.

The lead film can either be left on the work, in which case the scale-removing treatment is reduced to a single treatment followed by rinsing, or this lead film can be very quickly and thoroughly stripped by a short subsequent treatment in an alkaline solution with reversed current; that is, making the work the anode.

Where the work is to be machined or polished after the scale is removed, the lead film is left on because it is sufficiently thin to cause no difficulties and, as a matter of fact, in machining and drawing operations it will give a very slight element of metallic lubrication. In polishing operations it is not sufficiently thick to load the face of a polishing wheel, but it is thick enough to give a highly desirable approximation of a grease wheel effect.

The process can be operated continuously, as the control of it is simple from every angle. The temperatures are not high, being about 150° F. in the scale-removing treatment. The current density is moderate, running from 60 to 75 amperes per square foot. Happily such current densities can be obtained with ordinary six-volt standard electro-plating dynamos and the average anode to cathode spacing used in electro-plating. This means that the investment in motor generator sets is low, and that existing electro-plating equipment can readily be altered to give the advantages of the Bullard-Dunn Process for cleaning scales, oxides and metallic films from the work just prior to its being placed in the electro-plating bath.

The chemicals used in the solutions are non-poisonous and fumes only need ventilation common to modern plating rooms.

The time cycle for the Bullard-Dunn Cleaning Process varies with the nature of the metal, the nature of the scale, and with the thickness of the scale. For example, low carbon steels can be freed from annealing scale in two to three minutes, high carbon steels in five to ten minutes, alloy steels in longer time, depending upon, as pointed out, the nature of the alloy and the nature and thickness of the scale; but in every case the scale can be removed completely without any damage whatsoever to the base metal or any loss of base metal itself, in times that are always very considerably under the time required by pickling or any other known process.

The history of the development of the process is sufficiently interesting to justify an outline of it.

Some five years ago the Bullard Company undertook to manufacture automobile bumper bars in addition to their line of big automatic machine tool units.

As you know, a bumper bar is made by taking a steel bar, heating it and forming it. The bar is then heat-treated to convert it into a spring. It is then polished on the face, cleaned, electro-plated and buffed.

The Bullard Company had no sooner begun the manufacture of bumper bars when they ran into difficulties with their polishing on account of the heat scale produced when the bumper bar is converted into a spring. They thereupon set to work to find a method of removing this scale. After consulting with various and sundry experts, all the methods suggested were tried out. None of them could be considered satisfactory.

Sandblasting was expensive and ineffective since it did not remove the scale thoroughly, but actually merely broke up the surface scale and left the bar with small splinters of scale embedded into the surface. The back side of the bar was not well cleaned, so that the scale left on it formed a perfectly good breeding ground for corrosion. The eye of the bumper bar, which, as you know, is customarily used to hook the work to the plating racks, was not cleaned, and this resulted in a poor electrical contact which interfered with good electro-deposition.

Scratch brushing had all of the faults just described in connection with sandblasting, except that scratch brushing did eliminate the excessive air cost, nozzle wear and general destructiveness of

the sandblast method, whether sand or steel shot was used. Scratch brushing was an expensive operation from the standpoint of thorough scale removal.

Rolling and tumbling were tried with equally poor results.

Pickling was then used with and without inhibitors, with and without current, direct, reversed and alternating. None of these methods were satisfactory. All forms of pickling produced pitting and etching, and hydrogen embrittlement. The pitting and etching magnified the difficulties of polishing instead of simplifying them by merely removing the scale.

After all these methods were tried out and all the suggestions secured from the various experts were worked over, a complete new start was made on the problem. This new start resulted in the discovery of the Bullard-Dunn Process for metal cleaning, which, as has been stated, is completely successful and unique in that there are no references to any such process either in the patent office records or the literature of this country, or any other where such records exist.

The bumper bars at the Bullard plant, before the discovery of the Bullard-Dunn Process, were polished beginning with No. 30 wheels. After these bars were cleaned by the Bullard-Dunn Process with the lead film left on, the first polishing wheels were set up with No. 90 abrasive.

A noticeable improvement was made in the plating, probably due to the better contact between the plating rack and the bar itself as a result of the cleaning of the eye of the bumper bar, but this improvement in plating was strikingly exhibited by the plate on the back side of the bumper bar, which was very much better from every standpoint because the back side of the bar was completely free from scales and oxides.

Now, immediately after the discovery of the advantages of this process for cleaning bumper bars, the Bullard Company applied the process to the cleaning of all forgings, heat-treated parts, and alloy gears used in their regular machine tool production. The savings which they have been able to make through this use of the process and the improvement of the quality of their finished product as a result, is the thing that prompted them to offer the process to industry in general where it has many interesting and useful applications.

On the question of costs, the cost of the process apparently is

competitive with the cheapest kind of pickling because such elements as a shortening of time, absolute freedom from the spoiled work of overpickling, and reduced upkeep on equipment, are factors that offset the additional costs of using this process as compared with pickling. For example, the cost of electrical energy which is not required in ordinary pickling but which is naturally a part of the Bullard-Dunn Process.

As contrasted with electro-pickling, this process has the advantage of requiring very considerably less electric energy, since the lead film deposited in the Bullard-Dunn Process produces a "stop-off" effect, which with electro-pickling must be approximated by the maintenance of the thick film of hydrogen gas over all parts of the cathode, and this gas film maintenance means high current density; in fact, a current density which is frequently impractical.

Now, since pickling is the cheapest known process of scale dissolving, and since the Bullard-Dunn Process will compete with it on a cost basis, it seems unnecessary to more than point out that the Bullard-Dunn Process is very considerably cheaper than sandblasting, sandrolling or scratch brushing.

APPLICATIONS

FRED P. DULLEA, 11 Sheridan Street, East Lynn, Mass.....Boston

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ELECTIONS

FRED P. DULLEA, 11 Sheridan Street, East Lynn, Mass.....Boston

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RESIGNATIONS

CONRAD TRANTOW, 935 Clay Street, Woodstock, Illinois.....Chicago

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TRANSFERS

CHARLES M. DOUGLASS.....From Philadelphia Branch to Montreal Branch
W. DINGLE.....From Indianapolis Branch to Anderson Branch
D. A. COTTON.....From Indianapolis Branch to Anderson Branch (Associate)

BRANCH NEWS

CHICAGO BRANCH

The regular monthly meeting of the Chicago Branch, A. E. S., was held July 11, 1931, at the Atlantic Hotel.

Meeting was called to order with President J. C. Kretschmer presiding. All other officers present. Delegate F. J. Hanlon read the delegates' report on the Rochester, New York, convention. The same was a very detailed report and was well received.

Delegate H. A. Gilbertson outlined a paper on "Plating Cold Rolled Steel." This paper will be published in the MONTHLY REVIEW.

The balance of the meeting was given over to our librarian, Mr. O. E. Servis, who found the following questions in question box:

Question—What effect does soap have when added to a nickel solution?
Answer—Would cause peeling.

Question—Does deposited metal hold to base metal by adhesion or on pressure?
Answer—This caused some lively discussion. All members took part. Other branches please help.

Question—How would you copper plate stainless steel?
Answer—Two formulas were given: Etch slightly in sulphuric water, strip clean at least 5 minutes in muriatic dip struck up in very weak copper, strike low in metal and height in cyanide.

Question—How can a zinc cadmium sol. be made to plate bright at all times? Is there a brightener that can be added to it?
Answer—Add sulphated castor oil.

Question—A cadmium sol. has 2½ ozs. of cadmium oxide, 1½ ozs. of sodium hydroxide and 7 ozs. free cyanide plates streaky. What is the reason?
Answer—Too dense—lack of cyanide—add 1-32 oz. per gal. of Instant Postum for brightener.

HARTFORD-CONNECTICUT VALLEY BRANCH

The Hartford-Connecticut Valley Branch, A. E. S., held its regular meeting on Monday evening, June 22, 1931, at the Springfield Chamber of Commerce, Springfield, Mass.

The meeting was called to order at 8:30 p.m. with President Fleming in the chair. Minutes of the previous meeting were read and approved. All communications were read and placed on file. No bills were presented.

The letter from Mr. Hay, asking the Branch to endeavor to increase its subscription to the research fund from $50 to $100, was tabled until after the convention.

It was voted to suspend our July and August meetings, due to so many of the members being away on their vacations, and also the difficulty to get speakers to talk during the usual hot weather in those two months.

It was voted to hold our first fall meeting in September at an open meeting, making it a social as well as a business meeting. A committee consisting of Mr. H. R. MacFadyen, Mr. Beloin and Mr. MacDermid was appointed to make arrangements for this meeting.

Delegates were instructed as to how to vote on various things which were expected to be brought up at the convention.

We are sorry to lose Mr. Tennant Elwin, past president and secretary-treasurer, as a member of our Branch, he having transferred to the Waterbury Branch.

The meeting was attended by only ten members, and was adjourned at 10:30.

V. E. GRANT, *Secretary.*

REMOVAL NOTICES

When you change your address you should notify your Branch Secretary at once so that your copy of THE MONTHLY REVIEW will reach you at your new address. Every month we receive a large number of Post Office removal cards showing that no forwarding address was given. Of course these names are removed from the mailing list at once and cannot be reinstated until we receive the correct address, as it is quite costly to send out copies of THE REVIEW and have to pay extra postage for their return.

ENTHUSIASM

IF YOU can't get enthusiastic about your work, it's time to get alarmed. Something is wrong.

Compete with yourself; set your teeth and dive into the job of breaking your own record.

No man keeps up enthusiasm automatically.

Enthusiasm must be nourished with new actions, new aspirations, new efforts, new vision.

It is a man's own fault if his enthusiasm is gone; he has failed to feed it.

And right here is the big reason why thousands of men hit high-water marks at thirty-five and then recede.

They can "do their work with their eyes shut," and that is the way they do it.

They have lost the driving power of enthusiasm.

They sleep at the switch. All they see in life is the face of the time clock. All they hear is the quitting whistle.

If you want to turn hours into minutes, renew your enthusiasm.

—Papyrus.

ANDERSON BRANCH

Meets first Monday of every month at 7:30 p.m. at the Anderson Indiana Y. M. C. A. R. M. Wagner, Secretary-Treasurer, 28 W. 12th St., Anderson, Indiana.

BALTIMORE-WASHINGTON

Meets in Enoch Pratt Library, Calhoun and Hollis Sts., Irvin H. Hahn, Secretary, 207 S. Sharp St., Baltimore, Maryland.

BOSTON

Meets at American House, Boston, Mass. First Thursday each month. Secretary A. W. Garrett, 45 King St., Dorchester, Mass.

BRIDGEPORT

Meets first and third Friday of each month at Chamber of Commerce Rooms, Stratfield Hotel. Secretary, T. H. Chamberlain, 859 Orange St., New Haven, Conn.

CHICAGO

Meets second Saturday of each month, at 8 p. m., Atlantic Hotel, 316 S. Clark St., Secretary, J. C. Kretschmer, 1914 Warner Ave.

CINCINNATI

Meets every Thursday, 7:30 p. m., at Vocational Training School, Spring and Liberty Sts. Secretary, Al Yeager, 2021 Sherman Ave., Norwood, Ohio.

CLEVELAND

Meets first Saturday of each month at Hotel Winton, Paul R. Stamm, Secretary, 947 Elbon Road, Cleveland Heights, Ohio.

DAYTON

Meets first Saturday of each month at the Y. M. C. A., Dayton, Ohio. Secretary, Robert G. Suman, 2734 Ridge Road, Dayton, Ohio.

DETROIT

Meets the first Friday of each month at the Hotel Statler, Louis II Room. Secretary, Chas. M. Phillips, 18933 Hickory Ave., Detroit, Mich.

GRAND RAPIDS

Meets second Friday of each month at 528 Lake Michigan Drive, N. W. Secretary, Jacob Van Dyke, 1361 Union Ave., N. E., Grand Rapids, Mich.

HARTFORD-CONNECTICUT VALLEY

Meets fourth Monday in each month alternately at the Chamber of Commerce 815 Main St., Hartford and the Chamber of Commerce 134 Chestnut St., Springfield. Secretary, Vernon Grant, 32 Jennings Road, Bristol, Conn.

INDIANAPOLIS

Meets second Saturday of each month at Hotel Denison. Secretary, Louis Mertz, 1725 Union St., Indianapolis, Ind.

LOS ANGELES

Meets second Wednesday of each month at the Chamber of Commerce Bldg., 9th floor, 1151 S. Broadway. Secretary, M. D. Rynkofs, 1354 W. 25th St., Los Angeles, Calif.

MILWAUKEE

Meets second and fourth Thursdays of each month at Cor. 3rd and Highland Ave., Frank J. Marx, 1431 W. Cherry St., Milwaukee, Wis.

MONTREAL

Meets second and fourth Friday of each month at 1437 Aylmer St. Montreal, Quebec, Canada, where the Secy-Treas. Mr. Charles Doherty, can be found at any time.

NEWARK

Meets first and third Fridays of each month at Franklin Hall, 41 Franklin St., Newark, N. J., at 8 p. m. Secretary-Treasurer, Geo. Ruster, P. O. Box 201, Newark, N. J.

NEW YORK

Meets second and fourth Fridays of each month in the World Building, Park Row, New York City, N. Y. Secretary-Treasurer, J. E. Sterling, 2581 46th St., Astoria, L. I.

PHILADELPHIA

Meets first Friday of each month in the Harrison Laboratory Building, University of Pennsylvania, 34th and Spruce Sts. Secretary, J. E. Underwood, 327 N 10th St., Camden, N. J.

PITTSBURGH

Meets first Friday of each month at 8 p. m., at downtown branch, Y. M. C. A. Secretary, S. E. Hedden, 227 Fifth St., Aspinwall, Pa.

PROVIDENCE-ATTLEBORO

Meets first and third Thursday of each month at 44 Washington St., Prov. Engineers Rooms, Providence, R. I. Secretary, J. H. Andrews, 19 Rosedale St., Providence, R. I.

ROCHESTER

Meets third Friday of each month at Hotel Seneca. Secretary, Chas. Griffin, 24 Garson Ave., Rochester, N. Y.

SAN FRANCISCO BRANCH

Meets at Plaza Hotel, San Francisco. Secretary, H. W. McKibben, 310 Tehama St., San Francisco, Cal.

ST. LOUIS

Meets second Friday of each month at the Plant of the Lasalco Co., 2828 LaSalle St. Secretary, C. T. McGinley, 8214 Fairham Ave., University City, Mo.

TOLEDO

Meets first Thursday of each month at Toledo Secor Hotel, Cherry and Page Sts. James M. Lee, Secretary, Barker Street, Fremont, Ohio.

TORONTO

Meets fourth Monday of each month at Canadian Foresters' Hall, 22 College St., Room No. 2. Secretary, H. W. Graham, 102 Robina Ave., Toronto, Canada.

WATERBURY

Meets second Friday of the month at Engineers Hall, No. 11 East Main Street. Wm. F. Guilfoile, Secretary, P. O. Box 961, Waterbury, Conn.

WORCESTER

Meets Directors' Room, Chamber of Commerce, Worcester, Mass. Roger H. Bryant, Secretary, 94 Grove St., Worcester, Mass.